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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|------------------------|---------------------|------------------|
| 10/707,388 | 12/10/2003 | Ramachandra Divakaruni | FIS920030274 | 1387 |

23550 7590 11/10/2005

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| EXAMINER |
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FULK, STEVEN J

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| ART UNIT | PAPER NUMBER |
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2891

DATE MAILED: 11/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/707,388

Applicant(s)

DIVAKARUNI ET AL.

Examiner

Steven J. Fulk

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 12 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goto et al. '880 in view of Wolf.

Goto et al. discloses a semiconductor device comprising a silicide resistor with a polysilicon base positioned below the silicide section (paragraph 28). The reference does not disclose using a silicide resistor in a plurality of back-end-of-line layers with a silicidation temperature less than a damaging temperature of the BEOL layers, nor does Goto et al. disclose the specifics of the silicide material properties.

Wolf teaches that group VIII metals (cobalt, palladium, platinum, and nickel) form silicides with polysilicon at temperatures of 600 °C or less which would not damage BEOL layers (vol. II, page 146), and tungsten and molybdenum form silicides at 600 °C or more (vol. I, page 387,400). Wolf also teaches the respective resistivities of silicides formed from cobalt, palladium, platinum, and nickel are 16-18, 30-35, 28-30, and 50 micro-ohms/cm (vol. II, page 146).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a silicide material described by Wolf in the resistor of

Goto et al. because the resistor could be formed in any layer of the semiconductor device, including BEOL layers, without causing thermal damage to the layer.

Response to Arguments

3. Applicant's arguments filed October 14, 2005 have been fully considered but they are not persuasive.

a. Applicant argues that Wolf does not teach using a silicide section positioned in one of a plurality of BEOL layers, and that Wolf only discloses using a silicide material for interconnect applications and not for a resistor application. This argument is not persuasive because interconnects are, by definition, part of the back-end-of-line process. Wolf teaches the resistivities of the silicide interconnect are equivalent to the silicide resistivities claimed by the applicant (vol. II, page 146), and thus the structural limitations of the silicide section are anticipated by Wolf. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ 2d 1647 (1987).

b. Applicant argues that Wolf's disclosure of the silicidation temperature of the metals does not suggest anything regarding a silicidation temperature that is less than a damaging temperature of a plurality of BEOL layers. This argument is not persuasive because the silicidation temperatures that result in the desired resistivity and are less than a damaging temperature of a plurality of BEOL layers are defined in applicant's specification as 600 °C or

less (spec, paragraph 20). Thus, the property of the silicide having a silicidation temperature less than a damaging temperature of a plurality of BEOL layers is anticipated by Wolf (vol. II, page 146; vol. I, page 387,400).

c. Applicant argues that there is no suggestion to combine the references. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the knowledge that silicides are used in BEOL layers and have resistive properties is both generally available to one of ordinary skill in the art and taught by Wolf 1986 & Wolf 1990.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be

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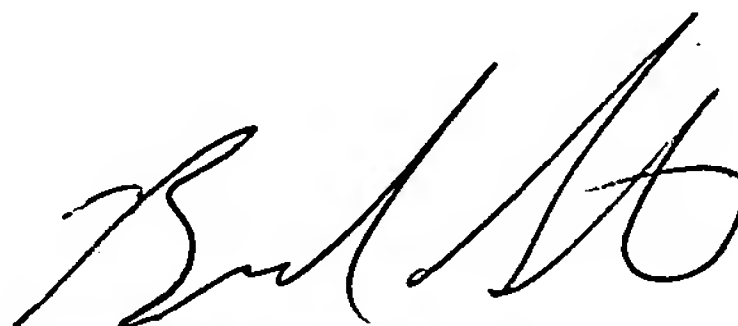
calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven J. Fulk whose telephone number is (571) 272-8323. The examiner can normally be reached on Monday through Friday, 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

sjf
11/4/05



BRADLEY K. SMITH
PRIMARY EXAMINER